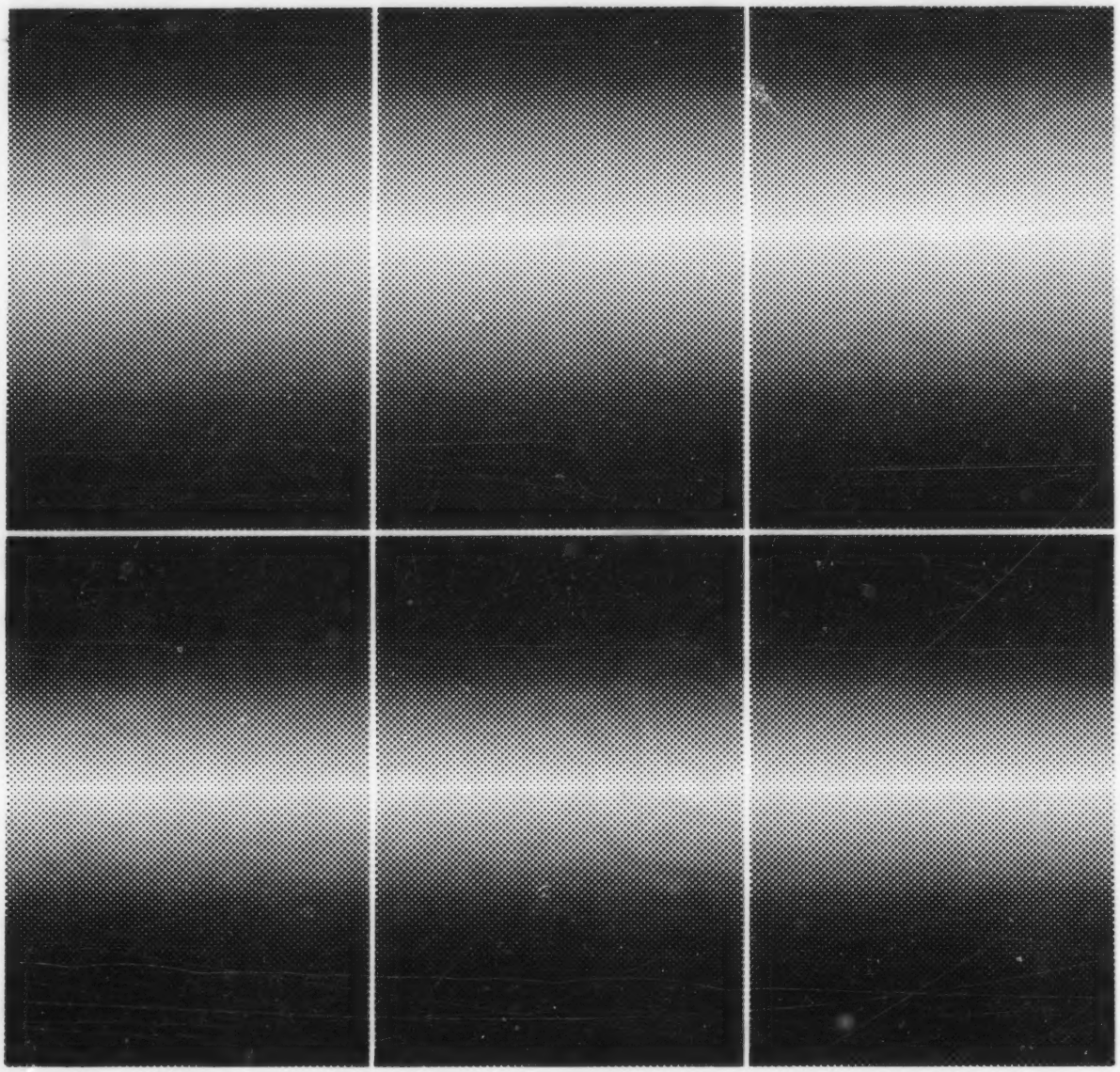
1981 manitoba insect control guide



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MANITOBA INSECT

CONTROL GUIDE

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INTRODUCTION

This Guide serves as a quick reference to the 1981 chemical insect control recommendations for Manitoba. It is intended for use by agricultural representatives, licenced pesticide dealers and commercial applicators.

Recommendations contained are based on those established by the Western Committee on Crop Pests and the Western Committee on Livestock Pests. The recommended insecticides have been selected for their effectiveness, availability, cost and safety. The number of insecticides recommended for the control of a specific insect have been kept to a minimum. Recommended insecticides are not necessarily the only ones which may be applied. Others may be applied, provided that the label carries a recommendation for the intended use.

Common names of insecticides are used throughout the Guide. Consult the list of common and trade names on page 15. Before using any insecticide, always consult the container label for directions and precautions.

RELATED PUBLICATIONS

More information on insects and their control may be obtained from these publications available through the Distribution Centre, Manitoba Department of Agriculture, 411 York Avenue, Winnipeg, Manitoba R3C 3M1.

Insect Control in the Home
Insect Control of Vegetables
Insect Control of Fruit
Insect Control on Field Crops
Insect Control on Livestock
Insect Control on Ornamental Plants
Control of Insects and Mites in Farm Stored Grain
Grasshopper Control in Manitoba
Insects and Mites of Manitoba

TOXICITY OF INSECTICIDES

This table rates the toxicity of insecticides recommended in this Guide. Some are extremely toxic to handle and use. Others, although less toxic, can be hazardous if carelessly applied. The lower the rating the more toxic the insecticide. Wear rubber gloves when handling and mixing any insecticide in concentrate form. An approved agricultural respirator and other protective equipment should be worn when handling, mixing or applying insecticides with a rating lower than 150.

INSECTICIDE	RATING	INSECTICIDE	RATING
aluminum phosphide	1	fenthion	215-320
azinphos-methyl	16.4	fenvalerate	451
carbaryl	560	lindane	88
carbofuran	8-14	malathion	480-5800
chlordane	300-600	metaldehyde	600-1000
chlorfenvinphos	10-20	methamidophos	18.9
chlorpyrifos	135	methidathion	25-54
coumaphos	90-110	methomyl	17-24
crotoxyphos	125	methoxychlor	5000-7000
crufomate	660-1000	permethrin	>4000
cypermethrin	251	phosmet	230
diazinon	300-400	phorate	1.6-3.7
dichlorvos	56-80	propoxur	90-100
dicofol	575-1100	pyrethrum	200
dimethoate	215	resmethrin	1100-1900
dioxacarb	60-150	ronnel	1500
endosulfan	110	rotenone	60-1500
ethylene dibromide	146	terbufos	4.5
fensulfothion	2-10	toxaphene	49-90
		trichlorfon	570-630

It is estimated that the amount of active insecticide which would constitute a lethal dose when taken orally is as follows:

TOXICITY RATING	AMOUNT OF ACTIVE INSECTICIDE
less than 5	a few drops
5-50	up to 5 mL (1 tsp)
51-500	5-50 mL (1 tsp-2 tbsp)
501-5000	30-450 mL (1-16 oz)
more than 5000	more than 450 mL (16 oz)

INSECTICIDE DRIFT

All insecticides are subject to some drifting, whether they are applied from the air or by ground equipment. Because insecticide drift can cause serious contamination, the user should be advised to make application of a formulation of insecticide less prone to drift. Particular attention should also be paid to wind velocity, and insecticides should be used only when wind is at a minimum, (less than 12 km/hr).

SEED TREATING

Almost invariably, more seed is treated than is sown in any particular year. It is therefore, extremely important that seed which is treated with insecticide be used for seeding only.

It is illegal to mix treated seed with grain to be used for human consumption.

Left-over treated seed cannot be used as feed for livestock of any type.

Left-over treated seed should be tagged properly and stored for seeding at a later time.

AERIAL SPRAYING

Unless otherwise specified ir the recommendations, at least 12 L of spray solution per hectare (1 gal/ac) should be applied to ensure adequate distribution of insecticide. Higher volumes provide better coverage and better control of insect pests.

Carry out aerial spraying only when wind velocity is below 12 km/hr (8 mph).

GROUND SPRAYING

Unless otherwise specified in the recommendations, 90 - 120 L water per ha (8-10 gal/ac) will provide adequate distribution of insecticide.

Ground spraying should take place when wind velocity is below 12 km/hr (8 mph).

INSECTICIDES AND POLLINATING INSECTS

The following points should be remembered when applying insecticides in the vicinity of pollinating insects. These considerations should be followed:

- All insecticides are toxic to honeybees and other beneficial insects. Farmers, beekeepers, pesticide dealers and pesticide applicators must co-operate closely to minimize insect losses.
- Only the least toxic insecticides to bees should be used where honeybees or other pollinating insects may be foraging. Notify beekeepers in the area so they have an opportunity to protect their colonies.
- The application of insecticides during the early morning and late evening hours lessens the possibility of causing injury to honeybees and other pollinating insects.

Maximum times required for some of the commonly used insecticides to be reduced by weathering to a low hazard level to honeybees are shown in the table below.

RESIDUAL TOXICITY OF SOME COMMON INSECTICIDES
TO HONEYBEES IN THE FIELD

INSECTICIDE	FORMULATION				
	SP	EC	F	WP	D
azinphos-methyl		4 days		14 days	
carbaryl			12 days	>12 days	>14 days
carbofuran			>1 day		
chlordane		<3 hrs			3 days
DDT		1 day		3 days	8 days
dimethoate		2 days			
endosulfan		3 hrs			1 day
endrin		<2 hrs		< 3 hrs	< 3 hrs
malathion		>7 hrs		> 1 day	> 1 day
methomyl				3 hrs	> 1 day
trichlorfon	2 hrs				< 3 hrs

< = Less than

> = More than

HOW INSECTICIDES KILL

Insecticides enter an insects body by way of contact on its outer shell or injestion through its mouth and kill by disruption of its nervous system.

Most insecticides are formulated for use as sprays that will contact the insect directly on application or have some residual contact for a period of time after the application. Most of our major crop insect pests such as grasshoppers, armyworms, flea beetles and aphids are killed by direct or residual contact from spray applications of insecticides.

Some insecticides are formulated for specialized uses that will kill specific insects in a specific way. Some common examples are systemic pour-on insecticides for warble grub control in cattle, systemic tree-trunk band applications for aphid control on trees and systemic granular or powder formulations for seed treatments for flea beetle control on rapeseed. These are just more unique methods of getting the insecticide to contact the insects or to be injested by it. Other examples of specialized formulations or applications of insecticides for insect control are scatter baits for farm fly control, fumigants for stored grain insect control and insecticide impregnated resin strips for indoor fly control. The insecticide whether applied as a direct spray or some other more specialized way has the end result of being absorbed through the insects outer shell or injested by feeding causing death by disruption of the nerve processes.

INSECT IDENTIFICATION

Over a million and a half insect species are known in the world. Fortunately not all are harmful nor present in economic numbers at all times. Nature is forever keeping insects in balance with the surroundings but often, because of man's interference and manipulation of nature, certain insects may get out of hand to become economic pests. At the present time, insecticides are the most effective means of combatting insect infestations.

Because there are so many different species of insects, their correct identification requires special training. Since some insecticides are specific and will not necessarily kill all insect pests, the proper identification of the insect to be controlled is very important. Insect identification services can readily be obtained by sending specimens to:

Entomology Section
Manitoba Department of Agriculture
910 Norquay Building
Winnipeg, Manitoba
R3C 0V8

Specimens should be carefully packed to ensure their proper conditions on arrival.

COMPATIBILITY OF INSECTICIDES AND OTHER PESTICIDES

In Manitoba it is rarely necessary to use more than one insecticide at the same time to combat an insect problem. Seldom is it advantageous to use an insecticide with a herbicide. However, insecticides and fungicides are frequently used together, especially by market gardeners.

In general, most of the pesticides used in Manitoba are compatible when mixed with another pesticide.

It may be advantageous at times to mix an insecticide with a herbicide for insect control on a limited area basis, but it is not recommended as a general practice for the following reasons:

1. Insect and weed problems seldom warrant control at the same time. Waiting to take control of both pests is likely to result in poor control of either or both.
2. Insect problems are specific to the crop and often on a limited area of the crop, so that using the two pesticides together may result in a high cost for insecticide which is not warranted.
3. When pesticides are mixed together, they must be used immediately. Delays after mixing the two pesticides, because of mechanical or other reasons, can result in loss of effectiveness.

Persons using two or more pesticides together should be advised to take the following precautions:

1. Use products formulated by the same company.
2. Obtain compatibility information from pesticide manufacturer if possible.
3. Apply chemical as soon as possible after mixing.

METHODS OF CALCULATING AMOUNT OF INSECTICIDE REQUIRED

Accuracy of pesticide application is important. Uneven application or wrong dosage can be costly. Applying more than the recommended amount increases costs and may make crops unfit for sale or use because of a high residue. Less than the recommended amount may result in poor control, and poor control of the pest may result in heavy crop damage.

Recommendations for spraying livestock and buildings are often given as percent of finished spray or as kg of insecticide formulation per number of litres of water. It is often desirable to be able to obtain the same strength spray using a different formulation or different amount of water. The following formulae may be used in making these calculations.

1. How to figure the amount of emulsifiable concentrate needed to mix a spray containing a given percentage of active toxicant.

FORMULA:

$$\frac{\text{litres spray needed} \times \text{\% toxicant required}}{\text{kg of toxicant/litre of emulsifiable} \times 100}$$

EXAMPLE: - Metric

How much 50% malathion (500 g/L) is needed to make 50 L of 0.5% malathion?

$$\frac{50 \times 0.5}{0.5 \times 100} = \frac{25}{50} = 0.5 \text{ litres of 50\% malathion}$$

EXAMPLE: - Imperial

$$\frac{\text{gal spray needed} \times \text{\% toxicant required} \times 10}{\text{pounds of toxicant per gal of emulsifiable} \times 100}$$

How much 50% malathion (5 lb/gal) is needed to make 10 gal of 0.5% malathion?

$$\frac{10 \times 0.5 \times 10}{5 \times 100} = 0.1 \text{ gal and fill to 10 gal}$$

2. How to figure the amount of wettable powder needed to mix a spray containing a given percentage of toxicant.

FORMULA:

$$\frac{\text{litres spray needed} \times \text{\% toxicant required}}{\text{\% toxicant used}}$$

EXAMPLE: - Metric

How many kg of 25% WP methoxychlor are needed to make 450 L of spray containing 0.5% toxicant.

$$\frac{450 \text{ L} \times 0.5}{25} = 9 \text{ kg}$$

EXAMPLE: - Imperial

$$\frac{\text{gal spray needed} \times \text{\% toxicant required} \times 10}{\text{\% toxicant used}}$$

How many lb of 25% wettable powder methoxychlor are needed to make 100 gal of spray containing 0.5 % toxicant?

$$\frac{100 \times 0.5 \times 10}{25} = 20 \text{ lb}$$

3. How to figure percent active toxicant in a spray mixture.

FORMULA:

$$\frac{\text{kg used} \times \text{\% active ingredient in insecticide}}{\text{L spray mixture}}$$

EXAMPLE: - Metric

4.5 kg of 50% methoxychlor wettable powder were mixed in 225 L of water. What % active methoxychlor was in spray?

$$\frac{4.5 \text{ kg} \times 50}{225 \text{ L}} = 1\% \text{ active methoxychlor}$$

EXAMPLE: - Imperial

$$\frac{\text{lb of insecticide used} \times \text{\% active ingredient in insecticide}}{\text{gal of spray mixture} \times 10}$$

EXAMPLE: - Imperial

10 pounds of 50% methoxychlor wettable powder were mixed in 50 gal of water. What % active methoxychlor was in the spray?

$$\frac{10 \times 50}{50 \times 10} = 1\% \text{ active methoxychlor}$$

4. Measure off a known distance; the number of metres (feet) of travel to spray one hectare (acre) or a fraction thereof.
5. Fill your supply tank full of water.
6. Spray the measured distance (4) as you would spray the field. Note speed of tractor and pressure of sprayer.
7. Carefully measure the number of litres (gallons) of water required to refill the tank. This is the volume sprayed.
8. Convert the volume sprayed to volume per hectare (acre) delivered by the sprayer at a given speed and pressure.
9. The volume per hectare (acre) delivered (8) divided into the volume of the tank will give the number of hectares (acres) a tankfull of spray will cover. This is the hectare (acre) capacity of the tank at that pressure and speed and for the type of boom used.
10. Add the amount of insecticide recommended per hectare (acre), multiplied by hectare (acre) capacity of the tank, to the empty tank and refill with water.

If the field is sprayed at the same speed and sprayer pressure, the required amount of insecticide per hectare (acre) will be delivered. Changes in the pressure or speed will change the calibration of the sprayer.

AREA COVERED BY DIFFERENT SPRAYER WIDTHS
OVER 0.81 km (½ mile) DISTANCE

SPRAYER WIDTH		AREA COVERED	
METRES	FEET	HECTARES	ACREAGE
9.3	30	0.74	1.82
9.6	31	0.76	1.88
9.9	32	0.79	1.94
10.2	33	0.81	2.00
10.5	34	0.84	2.06
10.9	35	0.86	2.12
11.2	36	0.89	2.18
11.5	37	0.91	2.24
11.8	38	0.94	2.30
12.1	39	0.96	2.36
12.4	40	0.98	2.42
12.7	41	1.00	2.48
13.0	42	1.03	2.54
13.3	43	1.05	2.60
13.6	44	1.08	2.66
13.9	45	1.10	2.72
14.3	46	1.12	2.79
14.6	47	1.15	2.85
14.9	48	1.18	2.91
15.2	49	1.20	2.97
15.5	50	1.23	3.03
15.8	51	1.25	3.09
16.1	52	1.28	3.15
16.4	53	1.30	3.21
16.7	54	1.32	3.27
17.1	55	1.35	3.33
17.4	56	1.38	3.39
17.7	57	1.40	3.45
18.0	58	1.43	3.51
18.3	59	1.45	3.57
18.6	60	1.48	3.64

EXAMPLE: A 10.9 m (35 foot) sprayer travelling 0.81 km (½ mile) will cover 0.86 ha (2.12 acre)

HOW TO CLEAN A CONTAMINATED SPRAYER

Sprayers that have been contaminated with herbicides can be used for insecticides without danger to susceptible crops, provided the following cleaning procedures are carried out:

1. Fill and flush out the sprayer three times using clean water.
2. Fill the tank with a mixture of 1 litre warm water and 20 mL household ammonia (1 cup ammonia to 3 gallons of water). Allow this mixture to stand in the tank for 1 to 2 days and then run it through the machine. More rapid results can be obtained if household ammonia is used with steam.
3. Wash out the sprayer with soapy water and rinse again with clean water.

SAFETY IN HANDLING AND APPLYING PESTICIDES

POISONING

The two types of poisoning are referred to as acute and chronic. Acute poisoning occurs as a result of a single large dose of pesticide. Chronic poisoning is the result of several small exposures over a period of time. Chronic poisoning may become acute if exposure is allowed to continue, it is more dangerous as symptoms can readily be confused with a cold or some other common ailment. If symptoms such as headache, nausea or dizziness occur after exposure to an insecticide take the person to a doctor immediately and take a container label with you. Some pesticides normally low in toxicity become much more toxic when used in combination with other pesticides.

SAFETY RULES

Insecticides may enter the body in three ways, through the skin, the mouth and by breathing the vapors. It is these three pathways which must be considered when handling pesticides. The hazards of insecticides may be largely reduced by observing the following precautions.

1. Read the label on the container. This may save your life and prevent accident. It will name the product and its most effective use. It will also explain how to handle the material and what should be done in the case of an accident.
2. When mixing spray solutions, wear protective clothing such as coveralls, goggles and rubber gloves. If concentrates are being handled, special care should be exercised. Agricultural respirators should be worn while handling volatile materials or dusts and sprays of extremely toxic insecticides.
3. When mixing seed treatments with seed, always wear goggles, respirator, gloves and arm protection such as a jacket.
4. Never mix spray solutions or treat seed inside a building. Do it outside so that the vapors can blow away.

5. Wear clean clothes each day when using pesticides.

6. Shower each day after using pesticides.

7. If insecticides are spilled on the skin, wash immediately and thoroughly with soap and water.

8. Change contaminated clothing as soon as possible and wash before reuse.

9. While spraying or dusting, prolonged exposure should be avoided, sprays and dusts should not be inhaled, smoking (especially handrolled cigarettes) should be avoided and all exposed parts of the body should be washed immediately after.

10. If you are taking drugs at the same time you are using pesticides, notify your doctor, since exposure to pesticides may alter the effectiveness of a drug.

11. Exercise care and caution when using pesticides, you may save a life or prevent serious illness.

12. If symptoms such as nausea, headache, blurred vision, numbness in fingers occur when using pesticides, see a doctor immediately. Take the pesticide container label with you, it will aid the doctor in his treatment.

13. Care should be taken not to contaminate feed or water for livestock. The rates of application contained on the labels should be followed, and the cautions with regard to the use of treated crops strictly observed.

CONTAMINATION OF WELLS, DUGOUTS AND OTHER WATER SOURCES

Farmers should be cautioned to use extreme care to avoid accidental spilling of any pesticide into wells, dugouts or other water sources used for human and livestock consumption. The following precautions should be observed.

1. If possible, sprayers should not be filled directly from wells, dugouts, etc. The use of portable water storage tanks will allow water to warm to air temperature for better mixing and eliminates the possibility of contamination of water supplies.

2. If a sprayer must be filled directly from a well, dugout or similar source, the sprayer intake hose should be removed from the water source before the sprayer pump is stopped. This will prevent backsiphoning of chemical from the sprayer to the water source.

CARE OF RESPIRATORS

To be completely reliable, safety equipment such as respirators should be properly looked after. The following cautions should be recommended to persons using respirators:

1. Filters should be changed twice a day or more often if breathing becomes difficult.

2. Cartridges should be changed after eight hours of use or oftener if any pesticide is detected.

3. Filters and cartridges should be removed and the face piece should be washed with soap and

water after use. Rinse to remove traces of soap. Face peice should be dried with a clean uncontaminated cloth and then placed in a well ventilated area to dry.

4. Respirators, filters and cartridges should be stored in a clean, dry place when not in use.

STORAGE OF INSECTICIDES

Insecticides should be stored in a special area set aside for this purpose which is not normally used by anyone. It should be in a warm location to prevent freezing of the insecticide. Labelling and locking of this area is an advisable procedure.

Pesticides should be stored in their original containers with an intact label. Avoid causing dents or scratches as these will weaken the container and possibly cause it to leak. Dispose of leaking containers.

DISPOSAL OF CONTAINERS AND SURPLUS SPRAY

1. CONTAINERS - paper or cardboard cartons may be burned on a hot fire composed of wood soaked in diesel fuel. The temperautre generated by an ordinary fire is not sufficient to ensure decomposition. REMEMBER THAT SMOKE FROM PESTICIDE FIRES MAY BE TOXIC, DO NOT ALLOW SMOKE TO DRIFT OVER PEOPLE, LIVESTOCK OR BUILDINGS.

- glass or metal containers must be decontaminated by rinsing thoroughly two or three times with a solution of equal parts chlorine bleach (ie. Javex) and water. The containers should then be broken or punctured and taken to the municipal dump for burial.

2. SURPLUS SPRAY MIXTURE - the best known method of disposing of surplus spray mixture is to spray it out in a specific area set aside for this purpose.

3. OLD OR UNWANTED INSECTICIDE - Contact the Manitoba Department of Agriculture, Entomology Section at 944-3857 in Winnipeg.

CLEANING UP SPILLS

Personal Protection and Cleanup Equipment

1. Broom
2. Shovel
3. Coveralls
4. Heavy rubber of P.V.C. gloves and boots
5. Respirators, dual cartridge agricultural type with pesticide cartridge
6. Hydrated lime - 2, 50 lb bags
7. Laundry bleach - 2 gallons of Javex or Chlorox
8. Caustic soda or lye
9. Heavy gauge plastic bags

When cleaning up any insecticide, coveralls, rubber gloves and boots should be worn.

When cleaning up moderately to very toxic chemicals, a respirator as well as the other equipment should be worn. These chemicals include: carbofuran, azinphos-methyl, methomyl, lindane, leptophos, chlorpyrifos, endosulfan, carbofenthion and methamidophos.

If chemical is spilled on clothing, or comes in contact with skin, immediately remove clothing and wash skin with soap and water. The clothing should be washed before being worn again.

LIQUID SPILLS

1. Spread hydrated lime over spill in sufficient quantity to soak up liquid.
2. Allow it to sit until all liquid is soaked up.
3. Sweep up and place in heavy gauge plastic bag.
4. Soak entire area with laundry bleach (Javex or Clorox) and spread more lime over the area.
5. Allow one or two hours for decomposition.
6. Sweep up and place in same heavy gauge plastic bags.
7. Remove sweeping to municipal dump for burial.

DRY POWDER

The procedure is the same as for liquid, except that the powder will have to be wetted before embarking on cleanup.

IN CASE OF ACCIDENTAL POISONING CONTACT :

POISON CONTROL CENTRE

Winnipeg Health Sciences
Children's Centre
685 Bannatyne Avenue
787-2591

CHOLINESTERASE TESTS

Organosphosphate insecticides are cholinesterase inhibitors which if inhaled or absorbed through the skin, can cause poisoning. A reduction in the amount of cholinesterase in the blood may indicate poisoning.

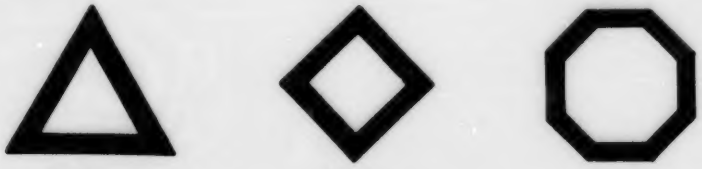
To guard against organosphosphate poisoning blood tests are taken to measure cholinesterase levels. Tests should be taken at the beginning and periodically throughout the crop season. Your physician will record your blood cholinesterase level and contact you if a change occurs. If a decrease in your level occurs, it indicates insecticide is entering your blood-

stream. Remedial action to prevent further exposure must be taken immediately.

CLASSIFICATION OF PESTICIDES

Pesticides are classified according to the use hazard and risk involved. The categories of hazard are: toxicity, flammability, explosive potential and corrosivity and the degree of risk is represented by symbols taken from common traffic sign shapes represented by the stop, caution and yield signs. The signal word for each of the signs is danger, warning and caution. Where the risk is minimal no designation is required. The label on Control Products will carry these signs for the protection of the user. When a product is registered its properties will be checked and it will be classified and categorized according to these properties. The symbols are listed below:

Degree of Risk Symbols



Caution *Warning* *Danger*

Category of Hazard Symbols

Poison *Corrosive* *Flammable* *Explosive*

COMMON AND TRADE NAMES OF INSECTICIDES

(Trade Names Capitalized)

aldicarb - Temik
aluminium phosphide - Phostoxin
Ambush - permethrin
azinphos-methyl - Guthion
Bacillus thuringiensis - Dipel
- Thuricide
Baygon - propoxur
Baytex - fenthion
Belmark - fenvalerate
bendiocarb - Ficam
borax
Birlane - chlorfenvinphos
carbaryl - Sevin
carbofuran - Furadan
chlordecone
chlorfenvinphos - Birlane
chlorpyrifos - Dursban
- Lorsban
Ciodrin - crotoxyphos
Ciovap - crotoxyphos-dichlorvos
Co-Ral - coumaphos
coumaphos - Co-Ral
Counter - terb fos
crotoxyphos - Ciodrin
crotoxyphos-dichlorvos - Ciovap
crufomate - Ruelene
Cygon - dimethoate
cypermethrin - Ripcord
Cythion - malathion
Dasanit - fensulfothion
DDVP - dichlorvos
diazinon
Dibrom - naled
dichlorvos - Vapona
dicofol - Kelthane
dimethoate - Cygon
Dipel - Bacillus thuringiensis
Dipterex - trichlorfon
disulfoton - Di-Syston
Di-Syston - disulfoton
Dursban - chlorpyrifos
Dyfonate - fonofos
Dylox - trichlorfon
Ectiban - permethrin
endosulfan - Thiodan
ethylene dibromide
ethylene dichloride
fensulfothion - Dasanit
fenthion - Baytex
- Tiguvon
fenvalerate - Belmark
Ficam - bendiocarb
fonofos - Dyfonate
Furadan - carbofuran
Guthion - azinphos-methyl
Imidan - phosmet
Kelthane - dicofol
Korlan - ronnel
Lannate - methomyl
lindane
Lorsban - chlorpyrifos
malathion - Cythion
mesurol
metaldehyde
methamidophos - Monitor
methidathion - Supracide
methomyl - Lannate
methoxychlor
mevinphos - Phosdrin
Monitor - methamidophos
naled - Dibrom
napthalene
Neguvon - trichlorfon
permethrin - Ambush
- Ectiban
- Sanbar
- Sentinel
phorate - Thimet

COMMON AND TRADE NAMES OF INSECTICIDES (cont'd)

Phosdrin - mevinphos
phosmet - Prolate
- Imidan
Phostoxin - aluminum phosphide
piperonyl butoxide
pirimicarb - Pirimor
Pirimor - pirimicarb
Prolate - phosmet
propoxur - Baygon
pyrethrum
resmethrin
ronnel - Korlan
rotenone
Ripcord - cypermethrin
Ruelene - crufomate
Sanbar - permethrin
Sentinel - permethrin
Sevin - carbaryl
Spotton - fenthion
Supracide - methidathion
Temik - aldicarb
terbufos - Counter
Thimet - phorate
Thiodan - endosulfan
Thuricide - Bacillus thuringiensis
Tiguvon - fenthion
toxaphene
trichlorfon - Dylox
- Neguvon
Vapona - dichlorvos

ABBREVIATIONS

L - liquid
PO - pour on
PCO - pest control operator
ULV - ultra low volume
WP - wettable powder
SC - spray concentrate
S - sprayable powder
SP - soluble powder
EC - emulsifiable concentrate
D - dust
G - granular
LS - liquid solution

METRIC SYMBOLS

Length - mm - millimetre
cm - centimetre
m - metre
km - kilometre

Area - ha - hectare

Pressure - kPa - kilopascal

Volume - mL - millilitre
L - litre

Weight - g - gram
kg - kilogram

METRIC RELATIONSHIPS

10 mm = 1 cm
10 cm = 1 m
1000 m = 1 km

1000 mL = 1 L
1000 g = 1 kg
10,000 m^2 = 1 ha

Host and Pest	Insecticide	MIXTURE AND METHOD OF TREATMENT Metric	Imperial	Minimum Days Application to Freshening	Safety Restrictions
DAIRY CATTLE					
Horn fly (apply insecticides when populations exceed 20 per animal)	coumaphos	Shaker can: Apply 56 g/animal into the hair on head, neck, shoulders and back.	Shaker can: Apply 2 oz/animal into the hair on head, neck, shoulders and back.	0	Do not repeat application within 10 days. Treat lactating dairy cows only after milking.
	crotoxyphos-dichlorvos	Apply as a coarse ready-to-use spray to dampen the hair on flanks, legs, brisket, head and neck.	Apply as a coarse ready-to-use spray to dampen the hair on flanks, legs, brisket, head and neck.	0	
	pyrethrum	Apply 28-56 mL prepared spray/animal daily to sides, back and underline.	Apply 1-2 fl oz prepared spray/animal daily to sides, back and underline.	0	Wash udder before milking.
Face fly	crotoxyphos-dichlorvos	Apply as a coarse ready-to use spray to animal's face once or twice/day.	Apply as a coarse ready-to-use spray to animal's face once or twice/day.	0	
Lice	carbaryl	Mix 10 kg 50%WP or 10 L 48% Suspension in 1000 L water. Apply to topline, sides and legs at about 4.5 L/animal as a high pressure spray.	Mix 10 lb 50%WP or 1 gal 48% Suspension in 100 gal water. Apply to topline, sides and legs at about 1 gal/animal as a high pressure spray.	0	Do not apply to underline or before milking.
	crotoxyphos	Apply 28-56 g of 3% dust/head for small and 56-113 g/head for large animals. Repeat in 2-3 weeks if required.	Apply 1-2 oz of 3% dust/head for small and 2-4 oz/head for large animals. Repeat in 2-3 weeks if required.	0	

Host and Pest	Insecticide	MIXTURE AND METHOD OF TREATMENT Metric	Imperial	Minimum Days Application to Freshening	Safety Restrictions
Lice (cont'd)	rotenone	Apply 1% dust to point of visible cover.	Apply 1% dust to point of visible cover.	0	Rotenone is highly toxic to hogs. Hogs should not be in area of treatment
Stable fly (apply insecticides when populations exceed 25 per animal)	crotoxyphos-dichlorvos	Apply as a course ready-to-use spray to dampen hair on flank, brisket, legs, head and neck.	Apply as a course ready-to-use spray to dampen hair on flank, brisket, legs, head and neck.	0	
BEEF CATTLE				to Slaughter	
Horn fly (apply insecticides when populations exceed 40 per animal)	coumaphos	Apply 56 g 1% shaker can/animal into the hair on head, neck, shoulders and back.	Shaker can: Apply 2 oz 1% shaker can/animal into the hair on head, neck, shoulders and back.	0	Application should not be repeated within 10 days. Do not inhale dust or get it in eyes or skin.
	crotoxyphos-dichlorvos	Apply as a coarse ready-to-use spray. Spray should dampen the hair on flanks, legs, brisket, head and neck.	Apply as a coarse ready-to-use spray. Spray should dampen the hair on flanks, legs, brisket, head and neck.	0	
		OR	OR		
		Use in backrubber device at the rate of 4.5 L ready-to-use mixture for each 6 m of cable. Backrubber should be kept full at all times.	Use in backrubber device at the rate of 1 gallon ready-to-use mixture for each 20 ft of cable. Backrubber should be kept full at all times.	0	
	ronnel	Mix 4.5 L ronnel 24E with 95 L diesel or #2 fuel oil and apply in a backrubber device.	Mix 1 gal ronnel 24E with 21 gal diesel or #2 fuel oil and apply in a backrubber device	7	

Host and Pest	Insecticide	MIXTURE AND METHOD OF TREATMENT Metric	Imperial	Minimum Days Application to Slaughter	Safety Restrictions
Horn fly (cont'd)	methoxychlor	Apply as a high pressure spray at the rate of 0.5 kg 50%WP in 45 L water and 2.2 L of mixture per animal	Apply as a high pressure spray at a rate of 1 lb 50%WP in 10 gal water and 2 qt of mixture/animal	7	Do not treat sick animals or animals under 1 month old
Stable fly (apply insecticides when populations exceed 50/animal)	crotoxyphos-dichlorvos	Apply as a coarse ready-to-use spray to dampen hair on flank, brisket, legs, head and neck. OR Apply in a backrubber device.	Apply as a coarse ready-to-use spray to dampen hair on flank, brisket, legs, head and neck. OR Apply in a backrubber device.	0 0	
Face fly	crotoxyphos-dichlorvos	Apply as a coarse ready-to-use spray to dampen hair on head, neck, brisket, legs and flank.	Apply as a coarse ready-to-use spray to dampen hair on head, neck, brisket, legs and flank.	0	
Cattle grub	coumaphos	Apply as a high pressure spray at a rate of 2 kg 25%WP in 100 L of water and 4.5 L of mixture per animal.	Apply as a high pressure spray at a rate of 2 lb 25%WP in 10 gal of water and 1 gal of mixture per animal.	7	Do not apply to lactating animals or more than once/season, sick animals, or animals less than 3 months of age. Avoid application during Dec., Jan. or Feb.
	trichlorfon	Pour-on at the rate of 15 mL 8% Pour-on per 45 kg body weight.	Pour on at the rate of ½ oz 8% Pour-on per 100 lb body weight.	21	Do not treat sick animals or calves under 3 months of age. Should not be used in conjunction with other organic phosphates. Avoid application in Dec., Jan. or Feb.

Host and Pest	Insecticide	MIXTURE AND METHOD OF TREATMENT Metric	Imperial	Minimum Days Application to Slaughter	Safety Restrictions
Cattle grub (cont'd)	fenthion	Apply Spotton with special applicator at 4 mL per 136 kg body weight. IMPORTANT: Apply on one spot on the backline of the animal.	Apply Spotton with special applicator at 4 mL per 300 lb body weight. IMPORTANT: Apply on one spot on the backline of the animal.	45	Do not apply during Dec., Jan. or Feb. Sick animals, animals under 3 months of age, or stressed animals should not be treated. Do not apply in conjunction with other organic phosphates. Avoid treatment within 10 days of shipping, weaning and dehorning.
	phosmet	Dilute 1 part phosmet in 2 parts or water. Add the water to phosmet while stirring. Apply 28 mL of fresh mixture per 45 kg body weight. Pour the mixture along the spine of the animal.	Dilute 1 part phosmet in 2 parts of water. Add the water to phosmet while stirring. Apply 1 oz of fresh mixture per 100 lb body weight. Pour the mixture along the spine of the animal.	28	Do not use more than 8 oz (226 g) of mixture on any animal. Calves under 3 months of age, or sick or stressed animals should not be treated.
Cattle lice	carbaryl	Apply with a hand rotary or puff duster at up to 0.5 kg of 5% dust per animal. Dust the entire animal thoroughly and repeat in 14 days.	Apply with a hand rotary or puff duster at up to 1 lb of 5% dust per animal. Dust the entire animal thoroughly and repeat in 14 days.	7	
	crotoxyphos	Apply 28-56 g of 3% dust per animal for small animals and 56-113 g per animal for large animals. Apply dust thoroughly to all parts of the animal.	Apply 1-2 oz of 3% dust per animal for small animals and 2-4 oz per animal for large animals. Apply dust thoroughly to all parts of the animal.	0	Do not treat calves under 3 months of age.

Host and Pest	Insecticide	MIXTURE AND METHOD OF TREATMENT Metric	Imperial	Minimum Days Application to Slaughter	Safety Restrictions
Cattle lice (cont'd)	rotenone	Apply 1% dust thoroughly to all parts of animal.	Apply 1% dust thoroughly to all parts of animal.	0	Rotenone is highly toxic to hogs if swallowed. Keep hogs away from area when dusting cattle.
	malathion	Apply as a high pressure spray at the rate of 1 L 50% malathion in 100 L water. Use 4.5 L of mixture per animal. Best time to treat is Oct. or Nov.	Apply as a high pressure spray at the rate of 16 fl oz 50% malathion in 10 gal water. Use 1 gal of mixture per animal. Best time to treat is Oct. or Nov.	7	Do not treat animals under 1 month of age or those nursing young. Avoid application to eyes, ears or nose of any animal.
		OR	OR		
		Use in a backrubber device as a 2% ready-to-use solution.	Use in a backrubber device as a 2% ready-to-use solution.	7	Do not treat animals under 1 month of age or those nursing young.
	ronnel	Dilute 1 part ronnel in 4 parts of water and pour-on 28 mL of mixture per 45 kg body weight. Repeat in 4 weeks if re-infestation occurs.	Dilute 1 part ronnel in 4 parts of water and pour-on 1 oz of mixture per 100 lb body weight. Repeat in 4 weeks if re-infestation occurs.	7	Do not apply to sick animals, or on animals within 1 month of calving. Do not use on show animals within 1 month of show.
		OR	OR		
		Mix 1 L of ronnel 24E in 100 L water and apply 5 L of mixture per animal as a high pressure spray.	Mix 1 pt of ronnel 24E in 12 gal water and apply 1 gal of mixture per animal as a high pressure spray.	7	Do not use on sick animals or young calves.
	trichlorfon	Apply 15 mL of Pour-on per 45 kg body weight during the winter.	Apply 0.5 fl oz Pour-on per 100 lb body weight during the winter.	21	Apply only to animals treated the previous fall with a systemic for cattle grub control.
	coumaphos	Apply 56 g of 1% dust from a shaker can per animal.	Apply 2 oz of 1% dust from a shaker can per animal.	0	Do not repeat within 10 days.

Host and Pest	Insecticide	MIXTURE AND METHOD OF TREATMENT Metric	Imperial	Minimum Days Application to Slaughter	Safety Restrictions
American dog tick	lindane	Mix 400 g 25%WP, 500 mL 20%EC or 1 L 11%EC in 100 L water and apply up to 4.5 L of mixture/animal according to size.	Mix 6.5 oz 25%WP, 8 fl oz 20%EC or 16 fl oz 11%EC in 10 gallon water and apply up to 1 gal of mixture per animal according to size.	30	One application usually sufficient for the tick season. Do not use on sick animals or animals under 3 months of age.
HOGS					
Mange mite	lindane	Mix 200 g 25%WP, 250 mL 20%EC or 450 mL 11%EC in 100 L water. Apply 1.1-2.2 L per animal to point of wetting the skin. Repeat in 14 days if necessary.	Mix 3.2 oz 25%WP, 4 fl oz 20%EC or 7.2 fl oz 11%EC in 10 gal water. Apply 1-2 qt per animal to point of wetting the skin. Repeat in 14 days if necessary.	30	For Veterinary use only.
	malathion	Mix 2 L 50%EC in 100 L water and apply 2.2 L per animal. Repeat in 12 days if necessary.	Mix 32 fl oz 50%EC in 10 gal water and apply 2 qt per animal. Repeat in 12 days if necessary.	0	Remove manure before spraying. Do not apply to young animals under 2 months of age or adult animals nursing young.
	coumaphos	Mix 1 kg 25%WP in 100 L water and apply as a spray. Repeat in 10 days if necessary.	Mix 1 lb 25%WP in 10 gal water and apply as a spray. Repeat in 10 days if necessary.	7	Do not apply to animals for 10 days before or after shipping, weaning-vaccination or other stress. Young animals under 3 months of age or sick animals should not receive treatment.

Host and Pest	Insecticide	MIXTURE AND METHOD OF TREATMENT Metric	Imperial	Minimum Days Application to Slaughter	Safety Restrictions
Lice	malathion	Mix 1 L 50%EC in 100 L water and apply 2.2 L of mixture per animal as a high pressure spray. Repeat in 14 - 18 days if necessary.	Mix 16 fl oz 50%EC in 10 gal water and apply 2 qt of mixture/animal as a high pressure spray. Repeat in 14-18 days if necessary.	0	Remove manure before spraying. Treat sows before farrowing. Do not treat young animals under 1 month of age or adult animals nursing young.
	coumaphos	Mix 1 kg 25%WP in 100 L water and apply 2.2 L per animal as a high pressure spray.	Mix 1 lb 25%WP in 10 gal water and apply 2 qt per animal as a high pressure spray.	7	Do not apply to sick or young animals under 3 months of age or on adult animals nursing young. Avoid treatment to animals for 10 days before or after shipping, weaning, vaccination or other stress
		OR	OR		
		Apply 28 g of 1% dust per animal to shoulders and back; 2 treatments 10 days apart in one season.	Apply 1 oz of 1% dust per animal to shoulders and back; 2 treatments 10 days apart in one season.	0	
HORSES					
Face fly	dichlorvos	Mix 5 mL of 20%EC and 85 mL of corn syrup in 85 mL water. Place 5 mL of mixture with a brush or spray to forehead of each animal. Apply while animals are in the barn during peak fly season.	Mix 1 tsp of 20%EC and 3 oz of corn syrup in 3 oz of water. Place 1/5 oz of mixture with a brush or spray to forehead of each animal. Apply while animals are in the barn during peak fly season.	n/a	

Host and Pest	Insecticide	MIXTURE AND METHOD OF TREATMENT Metric	Imperial	Minimun Days Application to Slaughter	Safety restrictions
Horn fly	dichlorvos	Apply 28-56 mL ready-to-use per animal as a light spray once or twice daily during periods of high fly activity.	Apply 1-2 oz ready-to-use per animal as a light spray once or twice daily during periods of high fly activity.	n/a	
Stable fly	dichlorvos	Apply 28-56 mL ready-to-use per animal as a light spray once or twice daily during periods of high fly activity.	Apply 1-2 oz ready-to-use per animal as a light spray once or twice daily during periods of high fly activity.	n/a	
Lice	lindane	Mix 125 g 25%WP, 150 mL 20%EC or 275 mL 11%EC in 100 L water and apply 4.5 L of mixture per animal as a high pressure spray. Repeat after 14-18 days if necessary. Spray entire animal.	Mix 2 oz 25%WP, 2.5 oz 20%EC or 4.4 oz 11%EC in 10 gal water and apply 1 gal of mixture/animal as a high pressure spray. Repeat after 14-18 days if necessary. Spray entire animal.	n/a	Do not apply to sick or young animals under 3 months of age.
Ticks	lindane	Same as for lice with exception of 1 application only.	Same as for lice with exception of 1 application only.	n/a	
	toxaphene	Mix 8.25 L 60%EC in 1000 L water and apply 1.1 L mixture/animal as a high pressure spray. Repeat in 12-16 days if necessary.	Mix 1 gal 60%EC in 120 gal water and apply 1 qt mixture per animal as a high pressure spray. Repeat in 12-16 days if necessary.	n/a	

Host and Pest	Insecticide	MIXTURE AND METHOD OF TREATMENT Metric	Imperial	Minimum Days Application to Slaughter	Safety Restrictions
SHEEP AND GOATS					
Ked	lindane	Mix 1.25 kg 25%WP, 1.5 L 20%EC, or 2.75 L 11%EC/1000 L water and apply 1.1-2.2 L/animal once as a high pressure spray.	Mix 1¼ lb 25%WP, 25 fl oz 20%EC or 44 fl oz 11%EC/100 gal water and apply 1-2 qt/animal once as a high pressure spray.	30	Do not use on milk goats or sick animals. Do not use on animals under 3 months of age.
	toxaphene	Mix 12.5 kg 40%WP in 1000 L water or 8.25 L 60%EC in 1000 L water. Apply 1.1 L of mixture per animal once as a high pressure spray.	Mix 12½ lb 40%WP in 100 gal water or 1 gal 60%EC in 120 gal water. Apply 1 qt of mixture/animal once as a high pressure spray.	28	Do not use on milk goats.
	ronnel	Mix 1 L ronnel 24E in 100 L water and apply 1.1 L/animal as a high pressure spray.	Mix 20 fl oz ronnel 24E in 12 gal water and apply 1 qt per animal as a high pressure spray.	28	Do not use on sick animals. May be applied on lambs and kids.
	rotenone	Apply 1% dust as required for control at sheering time.	Apply 1% dust as required for control at sheering time.	n/a	
Lice	lindane	Same as for ked.	Same as for ked.		
	ronnel	Same as for ked.	Same as for ked.		
	coumaphos	Mix 1 kg 25%WP in 100 L water. Apply once as a high pressure spray.	Mix 1 lb 25%WP in 10 gal water. Apply once as a high pressure spray.	7	Do not apply to animals for 10 days before shipping, weaning, vaccination or other stress. Sick animals or those under 3 months of age should not receive treatment.

Host and Pest	Insecticide	MIXTURE AND METHOD OF TREATMENT Metric	Imperial	Minimum Days Application to Slaughter	Safety Restrictions
Lice (cont'd)	rontenone	Apply 1% dust to point of visible cover twice, two weeks apart.	Apply 1% dust to point of visible cover twice, two weeks apart.		
Ticks	lindane	Same as for ked.	Same as for ked.		
POULTRY					
Lice	carbaryl	Apply 450 g of 5% dust per 100 birds with a hand, rotary or puff duster. Repeat in 4 weeks if necessary. Use 1.[1] kg of 5% dust per box for 50 birds in dust bath boxes.	Apply 1 lb of 5% dust per 100 birds with a hand, rotary or puff duster. Repeat in 4 weeks if necessary. Use 2.5 lb of 5% dust per box for 50 birds in dust bath boxes.	7	Do not contaminate nests, eggs or feed and water troughs.
		OR	OR		
		Mix 1.1 kg 50%WP in 113 L water and apply 4.5 L mixture per 100 birds as a low pressure spray. Repeat in 4-8 weeks as necessary.	Mix 2.2 lb 50%WP in 25 gal water and apply 1 gal mixture per 100 birds as a low pressure spray. Repeat in 4-8 weeks as necessary.		
	coumaphos	Mix 142 g 25%WP in 31.8 L water and apply 14 mL of spray per bird as a low pressure spray. Repeat as necessary but not more than once a week.	Mix 5 oz 25%WP in 7 gal water and apply ½ fl oz of spray per bird as a low pressure spray. Repeat as necessary but not more than once a week.	1	
		On litter, mix 284 g 25%WP in 31.8 L water. Apply 5 L mixture per 100 m^2 as a high pressure spray to litter walls, ceilings, floors, roosts, nests and adjacent areas.	On litter, mix 10 oz 25%WP in 7 gal water. Apply 1 gal mixture per 1000 sq ft as a high pressure spray to litter walls, ceilings, floors, roosts, nests and adjacent areas	n/a	Remove birds while spraying.

Host and Pest	Insecticide	MIXTURE AND METHOD OF TREATMENT Metric	Imperial	Minimum Days Application to Slaughter	Safety Restrictions
Lice (cont'd)	malathion	Mix 1 L 50%EC in 100 L water and apply 4.5 L mixture per 100-150 birds as a low pressure spray.	Mix 8 fl oz 50%EC in 5 gal water and apply 1 gal mixture per 100-150 birds as a low pressure spray.	7	
Mites	carbaryl	Same as for lice	Same as for lice	7	
	coumaphos	Same as for lice.	Same as for lice	1	
	malathion	Same as for lice.	Same as for lice	7	
Lesser meal worm	carbaryl	Mix 1.25 kg 50%WP in 100 L water. Apply as a spray to floor area in broiler houses after each batch of birds.	Mix 2½ lb 50%WP in 20 gal water. Apply as a spray to floor area in broiler houses after each batch of birds.	n/a	Do not contaminate feed or water troughs.
PETS					
Cat flea Dog flea	pyrethrum rotenone	Dust animals with pyrethrum 2% or rotenone 1% thoroughly at weekly intervals or as necessary. Dust bedding and other infested areas.	Dust animals with pyrethrum 2% or rotenone 1% thoroughly at weekly intervals or as necessary. Dust bedding and other infested areas.	n/a	

Crop and Pest	Insecticide And Most Common Formulation	Amount of Product Per hectare	Imperial Measure	Where and When to Apply	Minimum Days to Harvest, Feeding	Restrictions
WHEAT, BARLEY OATS AND RYE						
Aphids	dimethoate 4E	525 mL	7.5 fl oz/ac.	Barley prior to heading when aphid populations exceed 50/plant. All cereals after heading when populations exceed 50/head.	2	
	malathion 50EC	1.4 L	20 fl oz/ac.		7	Do not apply malathion when temperature is below 20°C.
Armyworms	carbaryl 80S	2.25 kg	32 oz/ac.	Spray when larval populations exceed 10/m^2 (yd^2).	14	
	malathion 50EC	2.8 L	40 fl oz/ac.		5	
	methomyl L	1.25 L	17 fl oz/ac.		21	Do not use methomyl or trichlorfon on rye.
	trichlorfon 4.2 Liquid	1.4 L	20 fl oz/ac.		21	
Cutworms	chlorpyrifos 4C	1 - 1.4 L	15-20 fl oz/ac.	When cutworms exceed 3-4/m^2 (yd^2).	60	Apply in 115-225 L water/ha (10-20 gal/ac)for best results. Do not apply on rye.
Grasshoppers	carbofuran 4.8 F	280 mL	4 fl oz/ac.	Spray when hopper populations exceed 7-12/m^2 (yd^2).	21	
	dimethoate 4E	500 mL 1 L	7.5 fl oz/ac. 15 fl oz/ac.		2 21	Use dimethoate 500 mL (7.5 fl oz) on young hoppers and 1 L (15 fl oz) rate on adults.

Crop and Pest	Insecticide And Most Common Formulation	Amount of Product Per hectare	Imperial Measure	Where and When to Apply	Minimum Days to Harvest, Feeding	Restrictions
Wireworms	Use dual purpose seed treatment containing lindane	As directed on container label		Apply to seed	n/a	Use only where known wireworm problems occur. Do not feed treated seed to livestock.
CORN						
Armyworm	methomyl L	1.25 L	17 fl oz/ac.	When armyworm populations exceed 10/m^2 (yd^2).	3	Apply as soon as larvae appear. Repeat as necessary at 3-5 day intervals.
Cutworms	chlorpyrifos 4C	1 - 1.4 L	15-20 fl oz/ac.	Apply as soon as damage is noticed.	60	Apply in 115-225 L water/ha (10-20 gal/ac) for best results.
European Corn Borer	carbaryl 80S	1.5-2.25 kg	1.3-2 lb/ac.	Spray when 50% of plants show shot-holing in leaf whorls (early July) and repeat in 7 days	1	Economic levels of infestation rarely occur in grain or forage corn
	methomyl L	2.6 L	37 fl oz/ac.		3	
	carbofuran 4.8F	1.1 L	16 fl oz/ac.		7	
Grasshoppers	malathion 50EC	1.6 L	24 fl oz/ac		7	
Wireworms	lindane	As directed on container label.		Treat seed.	n/a	

Crop and Pest	Insecticide And Most Common Formulation	Amount of Product Per hectare	Imperial Measure	Where and When to Apply	Minimum Days to Harvest, Feeding	Restrictions
FLAX						
Cutworms	chlorpyrifos 4C	1 - 1.4 L	15-20 fl oz/ ac.	When populations exceed 3-4/m^2 (yd^2).	100	Apply in 115-225 L water/ha (10-20 gal/ac) for best results.
Grasshoppers	carbofuran 4.8F	280 mL	4 fl oz/ac.	When hopper populations exceed 7-12/m^2 (yd^2).	21	
	malathion 50EC	1.6 L	24 fl oz/ ac.		7	
OILSEED CROPS						
Rapeseed, Mustard						
Bertha armyworm, Beet webworm, clover cutworm	chlorpyrifos 4C	875-1250 mL	12.5-17.5 fl oz/ac.	When larval populations exceed 10/m^2 (yd^2)	21	
	methomyl L	1.25 L	17 fl oz/ac.		8	
	methamidaphos 4.8	550-1100 mL	8 - 16 fl oz/ ac.		10	
Cutworms	chlorpyrifos 4C	1 - 1.4 L	15-29 fl oz/ ac.	When numbers exceed 3-4/m^2 (yd^2)	21	Apply in 115-225 L water/ha (10-20-gal/ac)
Diamondback moth	azinphos-methyl SC	1.4 L	20 fl oz/ ac.	When numbers exceed 270/ m^2 (30/ft^2).	30	Use trichlorfon during late evening if honeybees are foraging.
	malathion 50EC	700 mL	10 fl oz/ ac.		7	
	trichlorfon 4.2 Liquid	2.8 L	40 fl oz/ ac		11	

Crop and Pest	Insecticide And Most Common Formulation	Amount of Product Per hectare	Imperial Measure	Where and When to Apply	Minimum Days to Harvest Feeding	Restrictions
Flea beetles						
At Seeding	carbofuran 5G	4.5-5.5 kg	4-5 lb/ ac.	Mix with seed. Use drill seeder only.	n/a	Use only 5G formulation. Ineffective when seeded with discer. Do not contaminate feed or feed mixing equipment with carbofuran or lindane.
	lindane seed treatment	as directed on container label		Treat seed	n/a	
Foliage Sprays	azinphos-methomyl SC	280 mL	4 fl oz/ ac.	Apply post-emergence sprays when 25% of the cotyledons are damaged	30	Do not use azinphos-methyl, carbofuran or methidathion after pod formation. Do not apply more than 280 mL carbofuran per ha per season
	carbofuran 4.8F	140-280 mL	2-4 fl oz/ ac.		60	
	malathion 50EC	1.1 L	16 fl oz/ ac.		7	
	methidathion 25EC	700 mL	10 fl oz/ac.		10	Apply in 110 L water per ha (10 gal/ac) for ground spraying and in 22 L for aerial spraying (2 gal/ac).
Grasshoppers	carbofuran 4.8F	280 mL	4 fl oz/ac.		60	
	malathion 50EC	1.6 L	24 fl oz/ ac.		7	
Red turnip beetle	azinphos-methyl SC	550-800 mL	8-12 fl oz/ ac.	Spray field margins when infestations occur.	30	
	carbofuran 4.8F	280 mL	4 fl oz/ac.		60	

Crop and Pest	Insecticide And Most Common Formulation	Amount of Product Per Hectare	Imperial Measure	Where and When to Apply	Minimum Days to Harvest Feeding	Restrictions
Sunflowers						
Cutworms	chlorpyrifos 4C	1.4 L	20 fl oz/ ac.	When numbers exceed 3-4/m^2 (yd^2)	100	Apply in 115-225 L water per ha (10-20 gal/ac).
Sunflower beetle	azinphos-methyl SC	1.1 L	16 fl oz/ ac.	Spray when adult beetle populations exceed 1 per 2 seedling plants or when larval populations exceed 10-12/plant.		Do not apply azinphos-methyl after heads begin to form.
	carbofuran 4.8F	140-280 mL	2-4 fl oz/ ac		60	Use carbofuran 150 g (2 oz) rate for adult beetles.
	endosulfan 4E	1.4 L	20 fl oz/ ac.		60	
Thistle caterpillar	azinphos-methyl SC	1.1 L	16 fl oz/ ac.			Do not apply after heads begin to form.
FORAGE CROPS						
Alfalfa (seed)						
Plant bugs, Lygus bugs	dimethoate	1.4 L	20 fl oz/ ac.	Spray just before bloom or at least 7 days before putting bees in field. Respray when plant bug numbers exceed 5/sweep. Use trichlorfon if crop is in bloom.	28	If crop is cut for hay, follow minimum days to harvest.
	methidathion 25EC	1.1-2.2 L	16-32 fl oz/ ac.		10	
	trichlorfon 4.2 Liquid	2.8 L	40 fl oz/ ac.		14	Apply in late evening when bees are not foraging.
Sweet Clover						
Sweet clover weevil	azinphos-methyl SC	2.2 L	32 fl oz/ac.	Apply to seedling crops when weevil damage is first noticed.		Second year crops rarely need protection

Crop and Pest	Insecticide And Most Common Formulation	Amount of Product Per Hectare	Imperial Measure	Where and When to Apply	Minimum Days to Harvest, Feeding	Restrictions
Sweet clover weevil (cont'd)	carbaryl 80S	1.4 kg	20 oz/ac.			
	dimethoate 4E	1.4 L	20 fl oz/ac.			
Alfalfa, Clover Grasses						
Grasshoppers	carbofuran 4.8F	280 mL	4 fl oz/ac.	Spray when hopper populations exceed 13-25/m^2 (yd^2).	21	
	dimethoate 4E	500 mL- 1 L	7.5-15 fl oz/ac.		2-7	Use higher rate for adult hoppers.
	malathion 50EC	1.6 L	24 fl oz/ac.		7	
Pastures						
Grasshoppers	carbofuran 4.8F	280 mL	4 fl oz/ac.	Spray when hopper populations exceed 13-25/m^2 (yd^2)	1	Do not apply carbofuran more than twice per season.
	dimethoate 4E	500 mL-1 L	25-15 fl oz/ac.		2	Use higher rate for adult hoppers.
	malathion 50EC	1.6 L	24 fl oz/ac.		0	May be grazed on day of application.
SPECIAL CROPS						
Sugar Beets						
Beet webworm	trichlorfon 4.2 Liquid	2.8 L	40 fl oz/ac.	Spray early to late June when leaf damage occurs.	28	

Crop and Pest	Insecticide And Most Common Formulation	Amount Product Per Hectare	Imperial Measure	Where and When to Apply	Minimum Days to Harvest, Feeding	Restrictions
Cutworms	chlorpyrifos 4C	1.4-2.8 L	20-40 fl oz/ ac.	Spray seedling crops when damage occurs.	120	Apply in 115-225 mL water/ha (10-20 gal/ac).
Sugarbeet root maggot	carbofuran 10G	8.25 kg	7.5 lb/ac.	Apply to drill row at seeding.		
	terbufos 15G	7.3 kg	6.5 lb/ac			Do not apply terbufos in direct contact with seed.
Faba Beans						
Aphids	dimethoate 4E	500 mL	7.5 fl oz/ac.	Spray when 75% of the plants have 1 or more aphid colonies.		
Blister beetles	carbaryl 80S	1.4 - 1.7 kg	20-25 oz/ ac.	Spray field margins when infestations occur.		
Field Peas						
Aphids	dimethoate 4E	500 mL	7.5 fl oz/ ac.	Spray when 75% of the plants have 1 or more aphid colonies.		

VEGETABLE INSECTS

Crop and Pest	Insecticide	Amount of Product/ha Unless Otherwise Indicated	Imperial Measure	Where and When to Apply	Minimum Days to Harvest, Feeding	Restrictions
ALL VEGETABLES						
Cutworms	chlorpyriphos 4C	1.5-3.0 L	20-40 fl oz/ ac.	Apply along rows immediately when damage is seen.	Variable	Carefully observe waiting periods listed on container label for each crops.
BEETS						
Leafminers	malathion 50EC	2.2 L	32 fl oz/ac.	Spray when egg masses are noticed on underside of leaves.	7	For bunching beets only.
Tarnished plant bug	dimethoate 2E	1.5 L	20 fl oz/ac.		12	
CABBAGE, CAULIFLOWER, BRUSSEL SPROUTS, BROCCOLI	dimethoate 2E	1.5-3.0 L	20-40 fl oz/ ac.		4 (21 for Brussel sprouts)	
Aphids	malathion 50EC	1.1-3.0 L	16-40 fl oz/ ac.		7 (3 for Broccoli)	
	methamidophos	1.1-2.4 L	16-33 fl oz/ ac.		7-cabbage, cauliflower 14-Broccoli Brussel sprouts	
	permethrin EC	150-325 mL	2.3-4.7 fl oz/ ac.			

Crop and Pest	Insecticide	Amount of Product/ha Unless Otherwise Indicated	Imperial Measure	Where and When to Apply	Minimum Days to Harvest, Feeding	Restrictions
Cabbage worms, loopers, diamondback moth	Bacillus thuringiensis	Follow label rates.			0	
	diazinon 50E	1.1 L	16 fl oz/ ac.		5-Broccoli, cauliflower 14-Brussel Sprouts 7-Cabbage	
	fenvalerate EC	150-325 mL	2.3-4.7 fl oz/ ac.		14	
	methamidophos 4.8L	1.1-2.4 L	16-33 fl oz/ ac.		7-cabbage, cauliflower 14-Broccoli, Brussel Sprouts	
	methomyl L	1.25-2.5 L	17-33 fl oz/ ac.		7 (1 for cabbage)	
	permethrin 25E	140-280 mL	2-4 fl oz/ac.			
Flea beetles	carbaryl 80S	700-1500 mg	10-20 oz/ac.		3	
	endosulfan 4E	1.5-3.8 L	20-40 fl oz/ac.		7	
Root maggots	chlorfenvinphos 10G	550 g/300 m of row	20 oz/1000 ft of row	Work granules into top 1" (2.5 cm) of soil in 6 " (15 cm) band. Seed into band.	45	

Crop and Pest	Insecticide	Amount of Product/ha Unless Otherwise Indicated	Imperial Measure	Where and When to Apply	Minimum Days to Harvest, Feeding	Restrictions
Root maggots	fensulfo-thion 15G	365 g/300 m of row	13.3 oz/1000 ft of row	Apply granules at time of seeding	45	
Slugs	metaldehyde					Do not apply directly to plants. Use baits or liquid slug killers according to label directions.
CARROTS						
Leafhoppers	carbofuran 10G	44 kg	20 lb/ac			For prevention of aster yellows apply at time of seeding. Foliar sprays with other insecticides may be required during July and August for complete protection.
CELERY						
Aphids	malathion 50EC	2.2 L	30 fl oz/ac.		3	
Leafhoppers	malathion 50EC	2.4 L	32 fl oz/ac.	Spray twice weekly from time of emergence.		
Slugs	metaldehyde			Spray between rows (not on plants) in early June. Repeat as required or apply metaldehyde baits between rows.		

Crop and Pest	Insecticide	Amount of Product/ha Unless Otherwise Indicated	Imperial Measure	Where and When to Apply	Minimum Days to Harvest, Feeding	Restrictions
CORN (Sweet)						
European corn borer	carbaryl 80S	3.0 kg	40 oz/ac.	Apply 2 or more sprays at 7 day intervals beginning about July 15.	1	
	methomyl L	2.75 L	37 fl oz/ac.		3	
CUCUMBERS						
Cucumber beetle	azinphos-methyl SC	2.5 L	33.5 fl oz/ac.		6	
	endosulfan 4E	1.5 L	20 fl oz/ac.		2	
Aphids	malathion 50EC	2.2 L	30 fl oz/ac.		3	
EGGPLANT						
Aphids	malathion 50EC	1.1-3.0 L	16-40 fl oz/ac.		3	
Colorado potato beetle	carbaryl 80S	700 g	10 oz/ac.		1	
Flea beetle	endosulfan 4E	1.25-1.5 L	18-20 fl oz/ac.		2	

Crop and Pest	Insecticide	Amount of Product/ha Unless Otherwise Indicated	Imperial Measure	Where and When to Apply	Minimum Days to Harvest, Feeding	Restrictions
ONIONS						
Onion maggot (furrow treatment)	diazinon 5G	280-460 g/ 300 m of row	10-20 oz/ 1000 ft of row	Apply granules with positive feed Gandy-type applicator, in a 2-4" (5-10 cm) band close to, but not in direct contact with seed.		
	fensulfothion 15G	95 g/300 m of row	3.4 oz/ 1000 ft of row			
Onion maggot flies	diazinon 50EC	1.1 L	16 fl oz/ ac.	Spray when flies appear after seedlings emerge and during July.	10	
POTATOES						
Aphids	dimethoate 2E	1.5 L	20 fl oz/ ac.		7	
	malathion 50EC	1.8 L	24 fl oz/ac.		3	
Colorado potato beetle	azinphos-methyl SC	1.25-2.5 L	17-25 fl oz/ ac.		7	
	carbaryl 80S	700 g	10 oz/ac.		7	
	carbofuran 4.8F	450 mL	6.25 fl oz/ ac.		7	
	endosulfan 4E	1.5 L	20 fl oz/ac.		1	

Crop and Pest	Insecticide	Amount of Product/ha Unless Otherwise Indicated	Imperial Measure	Where and When to Apply	Minimum Days to Harvest, Feeding	Restrictions
Colorado potato beetle (cont'd)	fenvalerate EC	100-150 mL	1.4-2.3 fl oz/ac.		7	
	methamidophos 4.8L	1.8-1.9 L	24-26 fl oz/ ac.		14	
	methidathion 25EC	1.1 L	16 fl oz/ac.		14	
	permethrin 25E	560-840 mL	8-12 fl oz/ac			
Potato leafhopper	carbaryl 80S	1.5 L	20 oz/ac.		7	
	malathion 50EC	1.8 L	24 fl oz/ac.		3	
	methidathion 25EC	2.4L	32 fl oz/ac.		14	
RADISH						
Flea beetles	carbaryl 80S	700 g	10 oz/ac.		7	
	diazinon 50EC	1.1 L	16 fl oz/ac.		10	
	malathion 50EC	1.1 L	16 fl oz/ac.		7	
Radish maggot	diazinon 5G	560 g/300 m of row	20 oz/1000 ft of row	Apply granules in furrow when planting.		

Crop and Pest	Insecticide	Amount of Product/ha Unless Otherwise Indicated	Imperial Measure	Where and When to Apply	Minimum Days to Harvest, Feeding	Restrictions
RUTABAGA, TURNIP						
Flea beetles	diazinon 50EC	1.1 L	16 fl oz/ac.		14	
	endosulfan 4E	3.0 L	40 fl oz/ac.		45	
	malathion 50EC	1.1 kg	16 fl oz/ac.		7	
Root maggots	carbofuran 4.8F	567 g/300 m of row	20 fl oz/ 1000 ft of row	Apply granules in 4" (10 cm) band, 1" (2.5 cm) below soil surface. Plant seed ½" (1 cm) above centre of band.		
	fensulfo-thion 15G	370 g/300 m of row	13.3 oz/1000 ft of row	Apply granules in 4-6" (10-15 cm) band in top 1" (2.5 cm) of soil and seed into band centre.		
TOMATO						
Flea beetles	endosulfan 4E	1.5 L	20 fl oz/ac.		2	
	malathion 50EC	1.1 L	16 fl oz/ac.		3	

Crop and Pest	Insecticide	Amount of Product/ha Unless Otherwise Indicated	Imperial Measure	Where and When to Apply	Minimum Days to Harvest, Feeding	Restrictions
Variegated cutworm	carbaryl 80S	45 - 65 g/300 m of row	1.9-2.5 oz/ 1000 ft of row	Apply in 20-25 gal (90-112 L) water to ensure good coverage.		

Crop and Pest	Insecticide And Most Common Formulation	MIXTURE AND METHOD OF TREATMENT Metric	Imperial Measure	Minimum Days From Last Application To Harvest	Safety Restrictions
APPLE, PLUM OTHER FRUIT TREES					
Tent caterpillar	malathion 50%EC	Mix 1-2 mL in L water. Spray when larvae are seen or damage is noticed.	Mix 1-2 tsp in 1 gal water. Spray when larvae are seen or damage is noticed.	3	Do not apply malathion at temperatures below 20°C (68°F).
	methoxychlor 50%WP	Mix 2 mg in L water. Spray when larvae are seen or damage is noticed.	Mix 2 tsp in 1 gal water. Spray when larvae are seen or damage is noticed.	7	
	carbaryl 50%WP	Mix 5 mg in L water. Spray when larvae are seen or damage is noticed.	Mix 5 tsp in 1 gal water. Spray when larvae are seen or damage is noticed.	7	
Apple seed chalcid	methoxychlor 50%WP	Mix 2 mg in L water and spray about June 18. Repeat 1 week later.	Mix 2 tsp in 1 gal water and spray about June 18. Repeat 1 week later.	7	
Aphids	diazinon 12½%EC	Mix 6 mL in L water and spray as foliar spray. Repeat as necessary.	Mix 2 tbsp in 1 gal water and spray as foliar spray. Repeat as necessary	14	

Crop and Pest	Insecticide And Most Common Formulation	MIXTURE AND METHOD OF TREATMENT Metric	Imperial Measure	Minimum Days From Last Application To Harvest	Safety Restrictions
Aphids (cont'd)	dimethoate 2E	Mix 2 mL in L water. Apply as foliar spray. Repeat as necessary.	Mix 2 tsp in 1 gal water. Apply as foliar spray. Repeat as necessary.	7	
	malathion 50%EC	Mix 2 mL/L water and apply as a foliar spray. Repeat as needed.	Mix 2 tsp/gal water and apply as a foliar spray. Repeat as needed.	3	
Scale	diazinon 12½%EC	Mix 2 mL in L water. Apply as a spray to trunk and branch where scales are found.	Mix 2 tsp in 1 gal water. Apply as a spray to trunk and branch where scales are found.	14	
	carbaryl 50%WP	Mix 2-4 mg in L water; apply to infested areas.	Mix 2-4 tsp in 1 gal water; apply to infested areas.	7	
	malathion 50%EC	Mix 2 mL in L water and apply to infested areas.	Mix 2 tsp in 1 gal water and apply to infested areas.	3	
Plum curculio	methoxychlor 50%WP	Mix 3 mg in L water. Apply as a spray when fruit is just beginning to form. Repeat application 10 days later.	Mix 3 tsp in 1 gal water. Apply as a spray when fruit is just beginning to form. Repeat application 10 days later.	7	

Crop and Pest	Insecticide And Most Common Formulation	MIXTURE AND METHOD OF TREATMENT Metric	Imperial Measure	Minimum Days From Last Application To Harvest	Safety Restrictions
CURRANT, GOOSEBERRY					
Currant fruit fly	methoxychlor 50%WP	Mix 2 mg in L water and apply as spray when 80% of the fruit has set. Repeat application 10 days later.	Mix 2 tsp in 1 gal water and apply as spray when 80% of the fruit has set. Repeat application 10 days later.	14	
Imported currant worm	diazinon 12½%EC	Mix 4 mL in L water and apply as spray immediately when larvae are seen.	Mix 4 tsp in 1 gal water and apply as spray immediately when larvae are seen.		Do not spray during or after bloom.
	rotenone 1%D	Apply to plants after fruit is set.	Apply to plants after fruit is set.		
Aphids	malathion 50%EC	Mix 1.5 mL in L water and use as spray when aphids appear. Repeat as needed.	Mix 1¼ tsp in 1 gal water and use as spray when aphids appear. Repeat as needed.	3	Avoid applying malathion at temperatures below 20°C (68°F).
RASPBERRY					
Raspberry fruitworm	rotenone 4%WP	Mix 5 mg in L water. Apply first when berries start to form.	Mix 5 tsp in 1 gal water. Apply first when berries start to form.		

Crop and Pest	Insecticide And Most Common Formulation	MIXTURE AND METHOD OF TREATMENT Metric	Imperial Measure	Minimum Days From Last Application To Harvest	Safety Restrictions
Spider mites	dicofol 18½%EC	Mix 4 mL in L water. Apply when necessary and repeat as required.	Mix 2 tbsp in 1 gal water. Apply when necessary and repeat as required.	2	
COMMERCIAL APPLICATION					
STRAWBERRY					
Strawberry root weevil	chlordane 25%G	Apply 25-45 kg prior to planting. Work into top 8-15 cm of soil.	Apply 20-40 lb/acre prior to planting. Work into top 3-6" of soil.		Chlordane should not be applied more than once every 4 years.
Tarnished plant bug	azinphos-methyl 50%WP	Mix 1.1 kg in sufficient water/ha. Apply immediately after first blossoms and again in 7-10 days.	Mix 1 lb in sufficient water/ac. Apply immediately after first blossoms and again in 7-10 days.	5	
	dimethoate 2E	Mix 2.5 L in sufficient water/ha; apply when first blooms appear. Repeat application 10-12 days later.	Mix 50 fl oz in sufficient water/ac; apply when first blooms appear. Repeat application 10-12 days later.		

Crop and Pest	Insecticide And Most Common Formulation	MIXTURE AND METHOD OF TREATMENT Metric	Imperial Measure	Minimum Days From Last Application To Harvest	Safety Restrictions
Tarnished plant bug (cont'd)	endosulfan 50%WP	Mix 2.2 kg in sufficient water/ha and apply immediately after first blossoms. Repeat in 7-10 days.	Mix 2 lb in sufficient water/ac and apply immediately after first blossoms. Repeat in 7-10 days.	7	
Strawberry cutworm	chlorpyrifos 4C	Apply 1.5 mL in 2200 L water/ ha.	Apply 20 fl oz in 200 gal water/ac.	20	Apply between June 1 - 15.
Leaf rollers	azinphos-methyl 50%WP	Mix 1.1 kg in sufficient water/ha. Apply when insects first appear.	Mix 1 lb in sufficient water/ ac. Apply when insects first appear.	5	
	diazinon 50%EC	Mix 1.1 L in sufficient water/ ha applying when insects first appear.	Mix 16 fl oz in sufficient water/ ac applying when insects first appear.	5	
	malathion 50%EC	Mix 1.5 L in sufficient water/ha. Apply when insects first appear.	Mix 1 pint in sufficient water/ac. Apply when insects first appear.	3	
Cyclamen mites	dicofol 18½%WP	Mix 2.2 kg in sufficient water/ha and apply at pressure of 675-1375 kPa. Repeat as needed.	Mix 2 lb in sufficient water/ac and apply at pressure of 100-200 psi. Repeat as needed.	7	

Crop and Pest	Insecticide	Metric	Imperial Measure	Application	Remarks
HOME GROUNDS					
SPRUCE TREES					
Spruce budworm	Bacillus thuringiensis			Use according to label instructions.	
	dimethoate 4E	4 mL/L of water	2/3 fl oz/ gal of water	Spray foliage thoroughly in early June before buds are damaged.	With all chemical insecticides, more than one application will usually be required.
	malathion 50EC	2 mL/L of water	1/3 fl oz/ gal of water		Do not use malathion below 15°C.
	trichlorfon 4.2 Liquid			Use according to label instructions.	
Pine needle scale (attacks pine & spruce)	dimethoate 2E	4 mL/L of water	2/3 fl oz/ gal of water	Spray till foliage drips. One treatment in mid-June & one in August.	
	malathion 50EC	2 mL/L of water	1/3 fl oz/ gal of water		
	diazinon 12½EC	2 mL/L of water	1/3 fl oz/ gal of water		
Spruce spider mite	dicofol 18.5EC	2 mL/L of water	1/3 fl oz/ gal of water	Spray foliage until wet.	One treatment during third week in May followed by another in late June or early July.
	malathion 50EC	4 mL/L of water	2/3 fl oz/ gal of water		

Crop and Pest	Insecticide	Metric	Imperial Measure	Application	Remarks
TREES AND SHRUBS					
Aphids	diazinon 12½EC	6 mL/L of water	1 fl oz/ gal of water	Spray foliage thoroughly as required.	
	dimethoate 2E	2 mL/L of water	1/3 fl oz/ gal of water		Do not use dimethoate on American Elm.
	malathion 50EC	2 mL/L of water	1/3 fl oz/ gal of water		
Ash plant bug	carbaryl 50WP	2 mg/L of water	1/3 oz/gal of water	Apply when plant bugs are seen or stipling effect is observed on leaves.	
	diazinon 12½EC	2 mL/L of water	1/3 fl oz/ gal of water		
Cankerworm	Bacillus thuringiensis			Apply according to label instructions.	
	carbaryl 50WP	6 mg/L of water	1 oz/gal of water		
	malathion 50EC	150 mL/100 L of water	10 fl oz/40 gal water	Spray foliage when damage appears in spring.	
	methoxychlor 50WP	2 mg/L of water	1/3 oz/gal of water		
	tree tanglefoot	Ready-to-use	Ready-to-use	Apply to tree trunks in late September immediately after first heavy frost.	

Crop and Pest	Insecticide	Metric	Imperial Measure	Application	Remarks
Pear slug	carbaryl 50WP	2 mg/L of water	1/3 oz/gal of water	Spraying is usually required in late June and early July.	
	malathion 50EC	2 mL/L of water	1/3 fl oz/gal of water		
	rotenone	Ready-to-use	Ready-to-use		
Leafminers	diazinon 12½EC	2 mL/L of water	1/3 fl oz/gal of water		Two applications are necessary for full season control, one in spring and one about the end of July.
	dimethoate 2E	2 mL/L of water	1/3 fl oz/gal of water		
	malathion 50EC	2 mL/L of water	1/3 fl oz/gal of water		
Forest tent caterpillars	carbaryl 50WP	2-4 mg/L of water	1/3-2/3 oz/ gal of water	Spray foliage thoroughly soon after leaves have appeared in spring (when caterpillars are small).	Removal of egg bands in fall and early spring is helpful.
	diazinon 12½EC	2 mL/L of water	1/3 fl oz/ gal of water		
	malathion 50EC	2 mL/L of water	1/3 fl oz/ gal of water		
	methoxychlor 50WP	2 mg/L of water	1/3 oz/gal of water		
Sawflies	malathion 50EC	2 mL/L of water	1/3 fl oz/ gal of water	Spray foliage when insects and damage become evident.	
Gall insects					Effective control is not available. Damage usually does not effect tree health. Remove and burn galls if possible.

Crop and Pest	Insecticide	Metric	Imperial Measure	Application	Remarks
ELM					
Elm bark beetle	chlorpyrifos	5% solution	5% solution		Commercial use by municipalities only to control native elm bark beetle.
	methoxychlor	4-12% solution	4-12% solution	Apply between August 14 and September 5. Thoroughly wet lower 2.5 m (8 ft) of tree to base of root flare.	
Spiny elm caterpillar	malathion 50EC	2 mL/L of water	1/3 fl oz/ gal of water		Caterpillars are generally localized in one part of the tree. Spray where needed.
COMMERCIAL APPLICATION					Do not apply with aircraft at wind speeds in excess of 12 km/hr.
SPRUCE					
Spruce budworm	dimethoate 4E	1.6 L in at least 10 L of water/ha	24 fl oz in at least 1 gal of water/ac.	Aerial Application	Apply spray when the bulk of the larvae are in 3rd and 4th instars.
		1.5 L/1000 L of water	20 fl oz/100 gal of water	Hydraulic Ground Applicator	More than one application may be required to achieve adequate control.
	malathion 50EC	1.5 L in at least 10 L water/ha	20 fl oz in at least 1 gal of water/ac.	Aerial Application	
		1 L in 1000 L of water	16 fl oz in 100 gal of water	Hydraulic Ground Applicator	Do not use malathion at temperatures below 15°C.

Crop and Pest	Insecticide	Metric	Imperial Measure	Application	Remarks
Spruce budworm (cont'd)	trichlorfon 4.2 Liquid	2.8-3.5 L in at least 22 L water/ha	2-2 7/8 pts in at least 2 gal water/ac.	Aerial Application	May cause spotting of automobile paint surfaces.
		2.8-3.5 L in 1400 L of water/ha	2-2 7/8 pts in at least 125 gal water/ac.	Hydraulic Ground Applicator	
DECIDUOUS TREES					
Cankerworm	malathion 50EC	1.5 L in at least 10 L water/ha	20 fl oz in at least 1 gal of water/ac.	Aerial Application	Application of malathion at temperatures below 15°C should be avoided.
		1.5 L in 1000 L water	20 fl oz in 100 gal water	Hydraulic Ground Applicator	
	methoxychlor 50WP	1 kg in 1000 L water	16 oz in 100 gal water	Hydraulic Ground Applicator	
Forest tent caterpillar	malathion 50EC	625 mL in at least 10 L/ha	10 fl oz in at least 1 gal/ac.	Aerial Application	Spray when the hatch is 90%-95% complete and larvae are still small.
	methoxychlor 50WP	1 kg in 100 L water	16 oz in 100 gal water	Hydraulic Ground Applicator	Do not apply malathion at temperatures below 15°C.
	trichlorfon 4.2 Liquid	675 mL/ha	9.5 fl oz/ac.	Aerial Application & Hydraulic Ground Applicator	
Scale Insects	carbaryl 50WP	55-70 mg/45 L water	2-2.5 oz/10 gal water	Hydraulic Ground Applicator	Apply chemicals during crawler stage approximately mid-June.
	diazinon 12½EC	225 mL/450 L water	8 oz/100 gal water	Hydraulic Ground Applicator	
	dimethoate 2E	225 mL/450 L water	8 oz/100 gal water	Hydraulic Ground Applicator	

Crop and Pest	Insecticide	Metric	Imperial Measure	Application	Remarks
Scale insects (cont'd)	malathion 50EC	225 mL/450 L water	8 oz/100 gal water	Hydraulic Ground Applicator	

TURF INSECTS

Crop and Pest	Insecticide And Most Common Formulation	Metric	Imperial Measure	Application	Remarks
Ants	chlordane 40%EC	125-275 mL/ 100 m^2	4.5-9.0 fl oz/ 1000 ft^2	Water into soil after application	Apply chlordane to established lawns only.
	diazinon 12½%EC	300-600 mL/ 100 m^2	10-20 fl oz/ 1000 ft^2	Apply in 10-20 gal (50-90 L) of water	Mow lawn before treatment. Water thoroughly after treatment.
Earthworms Dew worms	chlordane 40%EC	60 mL/100 m^2	20 fl oz/1000 ft^2	Apply in 20 gal (90 L) water	Restricted to use on golf courses by a licenced applicator. Water thoroughly after treatment.
Glassy cutworm	diazinon 12½%EC	250 mL/5 L water/100 m^2	8 fl oz/gal water/1000 ft^2		Water thoroughly after treatment.
Sod webworm	chlordane 40%EC	125 mL/5 L water/100 m^2	4-4½ fl oz/gal of water/1000 ft^2		Apply chlordane to established lawns only.
	diazinon 12½%EC	300-600 mL/5 L water/100 m^2	10-20 fl oz/gal water/1000 ft^2		Water thoroughly after treatment.
White grub	chlordane 40%EC	125-275 mL/5 L water/100 m^2	4½-9 fl oz/gal water/1000 ft^2		Apply chlordane to established lawns only.
	diazinon 12½%EC	600 mL/5 L water/100 m^2	20 fl oz/gal water/1000 ft^2		Water thoroughly after treatment. Apply between July and early October.

HOUSEHOLD INSECTS

Pest	Insecticide And Most Common Formulation	Metric	Imperial Measure	Where to Apply	Remarks and Precautions
Ants	diazinon 12½%EC	50 mL in L water	1 oz in 1 pint of water	Spray around doorsteps and lower windows to prevent entry to home. Indoors, spray around sinks, baseboards and other areas where ants are found.	Do not treat countertops or other surfaces coming in direct contact with food.
	propoxur	1% ready-to-use aerosol	1% ready-to-use aerosol		
Bedbugs	malathion (premium grade) 83.6%	8 mL in L water	1 tsp in 1 pint water	Spray bed springs and frames, cracks and crevices in walls where bedbugs hide. Mattresses, particularly tufts and folds should be lightly sprayed.	Use only premium grade deodorized malathion.
Black carpet beetle	diazinon 12½%EC	50 mL in L water	1 oz in 1 pint water	Spray cracks and crevices around baseboards or where larvae are noticed.	Vacuuming of baseboards and other hiding places eliminates carpet beetles. Protect stored woolens and other material fabrics with moth flakes
	malathion (premium grade) 83.6%EC	50 mL in L water	1 cz in 1 pint water		
	propoxur	1% ready-to-use aerosol	1% ready-to-use aerosol		
Clothes moths	propoxur	1% ready-to-use aerosol	1% ready-to-use aerosol	Spray infested storage areas.	Protect woolens and other natural fabrics with moth flakes.

Pest	Insecticide And Most Common Formulation	Metric	Imperial Measure	Where to Apply	Remarks and Precautions
Clover mites	diazinon 12½%EC	6 mL/L water	1 oz/gal water	Spray diazinon, dicofol or malathion on grass around foundation to prevent migration of mites from grass into home.	Apply at rate of 5 L spray mixture/10 m^2 of lawn area (1 gal/100 ft^2).
	dicofol 18.5%EC	6 mL/L water	1 oz/gal water		
	malathion 50%EC	20 mL/L water	3 oz/gal water		
	propoxur	1% ready-to-use aerosol	1% ready-to-use aerosol	Spray indoors around windows and doors to prevent entry of mites.	
Cockroaches	diazinon 12½%EC	50 mL/L water	1 oz/pint water	Apply to areas where cockroaches are commonly seen.	Avoid contamination of food or utensils.
	permethrin	1% ready-to-use aerosol	1% ready-to-use aerosol		
	propoxur	1% ready-to-use aerosol	1% ready-to-use aerosol		
Crickets	diazinon 12½%EC	50 mL/L water	1 oz/pint water	Spray area around house particularly near entrance.	
	propoxur	1% ready-to-use aerosol	1% ready-to-use aerosol	Apply indoors around entrances.	
Fleas (cat & dog)	propoxur	1% ready-to-use aerosol	1% ready-to-use aerosol	Apply to infested areas.	Keep infested dogs and cats out of the house. Dust pets thoroughly with commercial flea powders.

Pest	Insecticide And Most Common Formulation	Metric	Imperial Measure	Where to Apply	Remarks and Precautions
Houseflies	pyrethrum	Ready-to-use aerosol	Ready-to-use aerosol	Apply as required as a space spray.	Ensure that doors and windows are screened. Keep garbage in tightly sealed containers to prevent fly breeding.
	resmethrin	Ready-to-use aerosol	Ready-to-use aerosol		
Centipedes, sowbugs, spiders, silverfish	diazinon 12½%EC	50 mL/L water	1 oz/pint water	Apply to cracks, crevices and other hiding places and surfaces where pests are found.	
	malathion (premium grade) 83.6%EC	50 mL/L water	1 oz/pint water		
	propoxur	1% ready-to-use aerosol	1% ready-to-use aerosol		
Larder beetles	propoxur	1% ready-to-use aerosol	1% ready-to-use aerosol	Apply to storage areas where larvae are found.	Destroy infested food. Clean storage areas before spraying.
Stored food insects, flour beetles	malathion (premium grade) 83.6%EC	50 mL/L water	1 oz/pint water	Spray storage shelves thoroughly. Packaged foods can be returned to shelves when spray has dried.	Destroy infested food and clean storage area before spraying.
	propoxur	1% ready-to-use aerosol	1% ready-to-use aerosol		
Strawberry root weevil	malathion 50%EC	50 mL/L water	1 oz/pint water	Apply around entrances of buildings to prevent entry.	

Pest	Insecticide And Most Common Formulation	Metric	Imperial Measure	Where to Apply	Remarks and Precautions
Wasps, hornet, bumble bees	malathion 50%EC	50 mL/L water	1 oz/pint water	Direct sprays into entrance holes of nests.	Spray in early morning or late evening when insects are in their nests. Wear mosquito netting, gloves, etc. to prevent strings.

Host and Pest	Insecticide	Metric	Imperial Measure	Safety Restrictions
Housefly	FLY BANDS AND STRIPS			
	dimetilan	Suspend Snip fly bands from ceiling. One band is sufficient for 7-9 m^2 of ceiling area. Bands should be replaced after 3-4 months.	Suspend Snip fly bands from ceiling. One band is sufficient for 75-100 ft^2 of ceiling area. Bands should be replaced after 3-4 months.	Avoid placing bands above feed or water troughs. Bury or burn old bands and containers outdoors.
	dichlorvos	Suspend 1 insect strip/30 m^3 air space. Replace after 3 months.	Suspend 1 insect strip/1000 ft^3 of air space. Replace after 3 months.	
	SCATTER BAIT			
	dichlorvos	Scatter 125 g of 0.25% bait/50-100 m^2 on floors, alleyways, doorways, window sills. Repeat as required.	Scatter ¼lb of 0.25% bait/500-1000 ft^2 on floors, alleyways, doorways, window sills. Repeat as required.	Do not use in milk rooms or milk processing rooms.
	dioxacarb	Scatter 125 g of bait/50 m^2 in doorways and alleyways.	Scatter ¼lb of bait/500 ft^2 in doorways and alleyways.	Keep out of reach of children, livestock, poultry or pets.
	RESIDUAL WALL SPRAYS			
	diazinon	Mix 1.9 L of 50%EC in 100 L water and apply 5-10 L mixture/100 m^2 at 3-4 week intervals. Walls, windows and other fly resting areas should be treated.	Mix 15 fl oz of 50%EC in 5 gal water and apply 1-2 gal mixture/1000 ft^2 at 3-4 week intervals. Walls, windows and other fly resting areas should be treated.	Remove animals before spraying and keep them out at least 4 hours after spraying.
	dimethoate	Mix 2.5 L 4E/100 L water. Apply 5 L mixture/50-100 m^2. Repeat as necessary. One application will provide up to 8 weeks control.	Mix 20 fl oz 4E/5 gal water. Apply 1 gal mixture/500-1000 ft^2. Repeat as necessary. One application will provide up to 8 weeks control.	Remove livestock and poultry before spraying. Do not contaminate feed, litter or water.

Host and Pest	Insecticide	Metric	Imperial Measure	Safety Restrictions
Housefly (cont'd)	permethrin	Mix 20 mL permethrin EC in 1 L water. Apply 5 L mixture/ 100 m^2 surface.	Mix 3.2 fl oz permethrin EC in 1 gal water. Apply 1 gal mixture/900 ft^2 surface.	Remove animals while spraying.
	ronnel	Mix 3.75 L 24E/100 L water and apply 5 L mixture/100-120 m^2. Repeat as required.	Mix 30 fl oz 24E/5 gal water and apply 1 gal mixture/1000-1200 ft^2. Repeat as required.	Do not contaminate feed or water.
	trichlorfon	Mix 160 g 80%SP in 100 L water and apply 5 L mixture /50 m^2. Apply to floors, walls, ceilings, around windows and other areas where flies congregate. Better residual control may be obtained by adding 100 g of sugar/L of mixture.	Mix 6 lb 4 oz 80%SP in 40 gal water and apply 1 gal mixture /500 ft^2. Apply to floors, walls, ceilings, around windows and other areas where flies congregate. Better residual control may be obtained by adding 1 lb of sugar/gal of mixture.	

STORED GRAIN INSECTS

Pest and Location	Insecticide	Metric	Imperial Measure	Rate of Application	Remarks
RUSTY GRAIN BEETLE, RED FLOUR BEETLE, SAWTOOTHED, GRAIN BEETLE, GRANARY WEEVIL					
Empty Bins	malathion	60 mL 50%EC/L water	10 fl oz 50%EC/ 1 gal water	5 L/100 m^2 (1 gal /1000 ft^2)	Apply to inside surfaces of bins. Wait one day before filling
Grain treatment	malathion (premium grade)	285 mL 83.6%/5-20 L water	10 fl oz 83.6%/ 2-5 gal water.	10-20 L/35 m^3 (2-5 gal/1000 bu) as it is augered into the bin.	Wait 7 days before selling treated grain.
	malathion (dust)			1.5 kg 0.5%/m^3 (1 lb 0.5%/bu)	Do not use malathion when grain temperature is below 5°C.
FUMIGATION OF GRAIN IN STORAGE	aluminum phosphide	Ready-to-use tablets	Ready-to-use tablets	180 tablets/35 m^3 (1000 bu) inject tablets evenly throughout grain.	Wax coating on tablets prevents release of gas for 4 hours after opening container. Phosphine is a very toxic gas; seal granary and post warning signs. Work in pairs. Use only when grain temperature is above 5°C (40°F).
	ethylene dibromide & carbon tetrachloride (liquid)	Ready-to-use	Ready-to-use	Steel bins-15 L/35 m^3 (3 gal/1000 bu); wood bins-30 L/35 m^3 (6 gal/1000 bu); Apply to surface of grain.	Use only when temperature is above 16°C (60°F). Liquid changes to a very toxic gas. Work in pairs; wear rubber gloves and full face respirator. Seal granary and post warning signs